

Relationships between depression, anxiety, sleep and coping skills among medical students: A cross-sectional study

Copin in medical students

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Abstract

Aim: Depression, anxiety and sleep problems may be elevated among medical students. No study up to now evaluated the relationships of those problems with coping skills among Turkish medical students. In this study, we aimed to evaluate the relationship between depression, anxiety, sleep and coping skills among medical students.

Material and Methods: This cross-sectional survey included 341 medical students and evaluated depression (Patient Health Questionnaire-9, PHQ-9), anxiety (Generalized Anxiety Disorder Scale, GAD-7), sleep problems (Pittsburgh Sleep Quality Index, PSQI) and coping skills (Coping Orientation to Problems Experienced, COPE) with self-reports. Preclinical and clinical students as well as female and male students were compared. Predictors of impaired sleep were evaluated with ordinal logistic regression. P-value was set at 0.05.

Results: Depression and sleep impairment were significantly more frequent among preclinical students while anxiety was significantly elevated among female students. Clinical students employed emotion-focused coping significantly more frequently. Dysfunctional coping correlated with self-reported depression, anxiety and sleep problems. The sole significant predictor of sleep impairment in the regression was the depressive symptom score.

Discussion: Preclinical students may benefit from interventions supporting active coping as well as social interactions. Clinical students may benefit from interventions targeting nicotine and alcohol use.

Keywords

Depression, Anxiety, Medical Students, Coping, Sleep

DOI: 10.4328/ACAM.21614 Received: 2023-01-23 Accepted: 2023-02-25 Published Online: 2023-03-06 Printed: 2023-05-01 Ann Clin Anal Med 2023;14(5):454-458

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This study was approved by the Clinical Research Ethics Committee of Marmara University Faculty of Medicine (Date: 2019-05-03, No: 09.2019.508)

Introduction

Medical school may be especially taxing for emerging adults attending university due to its duration and intensity of education, the stress of frequent examinations [1]. Previous studies have shown that depression, anxiety, and sleep problems may be elevated among medical students while their social support and coping may be reduced [2-4]. The ongoing COVID-19 pandemic may have compounded those problems [5]. Rates of depression among medical students may vary between 30.0-40.0 %, and students from Middle Eastern countries and female students may have higher rates [2-4]. Previous cross-sectional studies on Turkish medical students found that rates of depression varied between 13.2- 41.0%. Depression in those studies was associated with female gender, preclinical education, lower income, older age, a history of violence victimization, nicotine abuse, sleep disruption and residence in dormitories [2, 3].

Anxiety rates may also be elevated among medical students with rates varying between 7.7- 65.0 % globally [2]. The rates of anxiety varied between 4.0- 45.0 % in Turkish samples [4]. Factors associated with anxiety were female gender, residency examinations and uncertainty about the future [1]. Anxiety in medical students may also impair empathy and academic motivation [6].

Sleep quality may also be impaired among medical students [5]. In a recent meta-analysis of 29 studies conducted on 14,170 students, 39.8 % of students may complain of impaired sleep (95% Confidence Interval = 39.0-40.6%, 5). Sleep impairment may primarily consist of insufficient sleep duration and excessive daytime sleepiness, with deleterious effects on academic achievement [5]. Impairment in sleep quality among Turkish medical students varied between 42.0-70.0% [7]. Sleep problems among medical students may be related with female gender, nicotine/psychopharmacological treatment use, shiftwork, lower income, and elevated academic stress [5,7].

In contrast to depression, anxiety, and sleep problems, coping skills among medical students have received relatively limited attention [8]. Coping is defined as a voluntary effort to regulate emotions, thoughts and behaviors while experiencing stress and may be classified as problem- or emotion-focused [9, 10]. Coping behaviors may also be divided into adaptive (i.e., "active") and maladaptive (i.e., "passive" or "avoidant"). Ineffective/avoidant coping strategies may be related to anxiety, depression, and sleep problems among medical students [11].

Although depression, anxiety, sleep problems and coping skills have been previously studied among Turkish medical students, none of the studies evaluated the relationships between those four constructs simultaneously [1,3,7]. Therefore, this study aimed to evaluate the prevalence of clinically significant depressive/anxiety symptoms and sleep problems, and to evaluate coping skills among Turkish medical students according to education tiers (i.e., preclinical vs. clinical). We also aimed to evaluate the relationships between depression, anxiety, sleep impairment and coping skills.

Material and Methods

Study center, sampling and ethics

This study was conducted as a cross-sectional survey of 1200 medical students receiving education at the Marmara University Faculty of Medicine within the academic year 2021-2022. The dependent variable with the highest expected frequency according to the literature was sleep impairment (i.e., 41.1 %). Therefore, 426 participants from a 1200 population would be required with a 95% confidence interval and a design effect of 1.5. Stratified sampling according to educational tiers was used in selecting participants. IRB approval was acquired prior to the commencement of study and all the study procedures were in accordance with the Declaration of Helsinki. The study was approved by the Clinical Research Ethics Committee (09.2019.508).

Measures:

1. **Generalized Anxiety Disorder Scale (GAD- 7):** GAD-7 is a seven-item, four-point, Likert-type self-report evaluating anxiety with 5, 10 and 15 denoting mild, moderate and severe levels of anxiety [12, 13].

2. **Patient Health Questionnaire (PHQ-9):** PHQ-9 is a nine-item, four-point Likert-type self- report including DSM-IV criteria for major depression (5-9: mild depression, 10: -14: moderate, 15-19: moderate/severe, 20-27: severe depression) [14,15].

3. **Pittsburgh Sleep Quality Index (PSQI):** This self-report instrument evaluates sleep quality, latency, duration, habits, problems, use of hypnotics and daily functioning for the past month. Each domain is graded from 0 to 3 with higher scores denoting greater impairment. Total PSQI score varies between 0- 21 with 0-5 denoting healthy sleep. Scores between 6-10 denote impaired sleep while ≥ 10 correlates with chronic impaired sleep [16,17].

4. **Coping Orientation to Problems Experienced (COPE):** The COPE is a 60-item, 4-point self-report scale consisting of 15 subscales. The COPE consists of three main groupings -focused coping, emotion-focused coping and dysfunctional coping [18,19].

Statistical analysis

The data were entered into a database and analyzed with SPSS Version 23.0 (IBM Inc., Armonk, NY) and Jamovi Version 2.0 (The Jamovi project. 2021; <https://www.jamovi.org>). Nominal data were summarized with counts and frequencies, while quantitative data were summarized with means and standard deviations. Distributions of nominal data across groups were compared with a chi-square test with Fisher's exact test, Yates' correction, and linear-by-linear association as required. Assumptions of normality were evaluated with the Kolmogorov-Smirnov test and due to non-normality, quantitative variables across groups were compared with the Mann-Whitney U test. Bivariate correlations across quantitative variables were conducted with Spearman's rank order correlation analysis. Ordinal logistic regression with enter method was used to evaluate sleep impairment according to PSQI and predictors were entered in blocks. Model fit was evaluated with chi square

tests, deviance, Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC). Models were compared with chi-square tests. Omnibus likelihood ratio tests were conducted for predictors.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

Although 426 participants were planned, 85 students could not be enrolled due to non-attendance, resulting in 341 participants (i.e., 80.1 % of the planned sample, 50.4 % females) with a mean age of 22.1 (S.D.= 2.2, Range= 18.0- 28.0) years. There was no significant difference in terms of gender ($\chi^2= 0.3, p=0.871$).

Preclinical students were significantly more likely to live with their families as well as in dormitories compared to clinical tier medical students. Clinical tier students were significantly more likely to use nicotine and alcohol. Other than those the groups did not differ significantly.

Mean GAD- 7, PHQ-9 and PSQI scores of preclinical and clinical tier students were 6.4 (SD= 4.3) vs. 7.0 (SD= 4.2), 9.9 (SD= 5.0) vs. 7.9 (SD= 4.8) and 9.0 (SD= 2.5) vs. 8.8 (SD= 3.1), respectively. None of the tests displayed normality ($p < 0.001$, Kolmogorov-Smirnov test). According to bivariate comparisons, preclinical

students had significantly elevated PHQ-9 scores ($Z= 3.9, p < 0.001$, Mann-Whitney U test), while GAD-7 and PSQI scores did not differ significantly between groups. The sociodemographic features of the participants and symptom severities according to educational tiers are illustrated in Table 1.

In bivariate comparisons, preclinical students were significantly more likely to be classified with moderate, moderate- severe and severe depression, as well as report greater impairment due to symptoms in PHQ-9. Impaired and chronically impaired sleep were also significantly more common among preclinical students. However, the groups did not differ in terms of anxiety severity. Impairing depressive symptoms were not affected significantly by gender ($\chi^2=0.3, p=0.558$), living with family ($\chi^2=1.6, p=0.200$), nicotine, alcohol and substance use ($\chi^2= 0.2, p=0.694; \chi^2=0.6, p= 0.452$ and $\chi^2= 1.7, p= 0.190$; respectively). However, they were significantly related with impaired sleep ($\chi^2=29.8, p<0.001$; $\text{Eta}=0.31$, all linear-by-linear association). Moderate- severe anxiety was significantly more frequent among females ($\chi^2=6.0, p=0.015, \text{Eta}=0.14$). It was also significantly associated with sleep impairment ($\chi^2=17.9, p<0.001, \text{Eta}= 0.24$). Sleep impairment was significantly more frequent among students not living with their families ($\chi^2=11.6, p=0.003, \text{Eta}=0.10$).

Table 1. Sociodemographic and clinical features of Turkish medical students according to educational tiers.

	N (%)	Preclinical (n= 187)	Clinical (n= 154)	χ^2	P*	Effect size**
	Female gender	92 (49.2)	80 (51.9)	0.3	0.613	-
	Living with a family of origin	62 (33.2)	35 (22.7)	4.5	0.034	0.12
	Residence in dormitories	61 (32.8)	6 (3.9)	42.7	< 0.001	0.36
	Past psychiatric history	32 (17.1)	18 (11.7)	1.6	0.209	-
	Family psychiatric history	14 (7.5)	6 (3.9)	1.3	0.247	-
	Nicotine use	26 (13.9)	49 (31.8)	15.8	< 0.001	0.22
	Alcohol use	24 (12.8)	37 (24.0)	6.5	0.011	0.15
	Use of other substances	3 (1.6)	7 (4.5)	2.6	0.195	-
GAD-7	Mild anxiety	92 (49.2)	63 (40.9)	1.7	0.192***	-
	Moderate anxiety	63 (33.7)	61 (39.6)			
	Severe anxiety	32 (17.1)	30 (19.5)			
PHQ-9	Mild depression	72 (38.5)	72 (46.8)	10.6	0.001***	0.18****
	Moderate depression	51 (27.3)	32 (20.8)			
	Moderate – severe depression	27 (14.4)	9 (5.8)			
	Severe depression	9 (4.8)	5 (3.2)			
	Impairment with depressive symptoms	86 (46.0)	56 (36.4)			
PSQI	Impaired sleep	116 (66.3)	96 (63.6)	5.5	0.019***	0.13****
	Chronically impaired sleep	50 (28.6)	34 (22.5)			

*Chi-square test (with Fisher’s exact and Yates’ continuity corrections as needed), **: Phi, ***Linear-by-linear association, ****: Eta

Table 2. Bivariate correlations among depressive, anxious and sleep problems and coping skill domains in Turkish medical students.

Rho	GAD-7	PHQ-9	PSQI	Problem focus	Emotion focus	Dysfunctional
GAD-7	-					
PHQ-9	0.59**	-				
PSQI	0.35**	0.49**	-			
Problem focus	-0.11*	-0.19**	-0.04	-		
Emotion focus	-0.05	-0.09	-0.05	0.50**	-	
Dysfunctional	0.39**	0.33**	0.16**	-0.06	0.21**	-

*p<0.05, ** p< 0.001, GAD-7: Generalized Anxiety Disorder Scale, PHQ-9: Patient Health Questionnaire, PSQI: Pittsburgh Sleep Quality Index.

Table 3. Predictors of sleep impairment among Turkish medical students according to ordinal logistic regression.

Predictor	Odds Ratio	95 % Confidence Interval	P*
Female Gender	0.7	0.4- 1.1	0.099
Clinical educational tier	0.7	0.4- 1.2	0.256
Living with family	0.8	0.5- 1.5	0.513
Non-smoker	0.6	0.3- 1.2	0.156
Not using alcohol	0.6	0.3- 1.3	0.235
Not using substances	1.2	0.3- 5.4	0.788
GAD-7	1.0	0.9- 1.1	0.999
PHQ-9	1.2	1.2- 1.3	<0.001
Problem focus	1.0	0.9- 1.0	0.058
Emotion focus	1.0	1.0- 1.1	0.085
Dysfunctional coping	1.0	1.0- 1.0	0.408

*Omnibus likelihood ratio test, GAD-7: Generalized Anxiety Disorder Scale, PHQ-9: Patient Health Questionnaire

In bivariate comparisons, clinical tier students were significantly more likely to use emotion-focused coping compared to preclinical tier students. Male students were significantly more likely to use problems-focused coping ($Z = 2.6$, $p = 0.011$, Effect size = 0.14), while female students were more likely to use emotion-focused ($Z = 2.4$, $p = 0.018$, Effect size = 0.13) and dysfunctional ($Z = 3.7$, $p < 0.001$, Effect size = 0.20) coping.

Relationships between anxiety, depression, sleep impairment and coping skill domains in the whole sample were evaluated with Spearman's rank order correlation (Table 2).

In the whole sample, problem-focused coping displayed negligible, negative but significant correlations with depressive and anxious symptoms. Dysfunctional coping displayed low, positive, significant correlations with depressive and anxious symptoms, while its correlation with sleep problems was negligible and positive. Emotion-focused coping did not correlate with any of the symptoms. In the preclinical group, problem-focused coping did not correlate with any of the symptoms, while emotion-focused coping displayed negligible positive correlation with sleep problems ($\rho = 0.15$, $p = 0.044$). Dysfunctional coping displayed low, positive and significant correlations with all symptom domains ($\rho = 0.35$, 0.33 and 0.32 ; respectively for GAD-7, PHQ-9 and PSQI; all $p < 0.001$) among preclinical students. Among clinical tiers students, problem-focused coping displayed a negligible, negative correlations with PHQ-9 ($\rho = -0.19$, $p = 0.020$) and PSQI ($\rho = -0.25$, $p = 0.002$). Emotion-focused coping displayed a negligible, negative correlation with PSQI ($\rho = -0.26$, $p = 0.001$). Dysfunctional coping displayed low, positive and significant correlations with GAD-7 ($\rho = 0.41$, $p < 0.001$) and PHQ-9 ($\rho = 0.37$, $p < 0.001$).

Ordinal logistic regression with enter method was used to evaluate sleep impairment according to PSQI. Predictors were gender, living with family, educational tier, GAD-7, PHQ-9, alcohol use, nicotine use, problem focus, emotion focus and dysfunctional coping scores. Gender was entered first, followed by educational tier then living with family, alcohol and substance use were entered in the fourth step, GAD-7 and PHQ-9 in fifth

and COPE domains in the last step.

At the last step, the overall model was significant and could explain 18.1 % of the variance in sleep impairment. Among omnibus likelihood ratio tests for predictors at this step, only PHQ-9 was significant ($\chi^2 = 38.7$, $p < 0.001$), while gender ($\chi^2 = 2.7$, $p = 0.099$), problem focus ($\chi^2 = 3.6$, $p = 0.056$) and emotion focus ($\chi^2 = 3.0$, $p = 0.085$) remained at trend levels (Table 3).

Discussion

Previous studies have reported that 30.0- 40.0% of medical students may have clinically significant depressive symptoms [1-3]. Previous studies on Turkish medical students have shown depression rates of 13.2- 41.0% [1]. Almost half of the participants ($n = 144$, 42.2 %) reported mild depressive symptoms in the present study. Rates of severe, high and moderate impairment due to depressive symptoms were 0.9% ($n = 3$), 8.5 % ($n = 29$) and 32.3 % ($n = 110$), respectively. Therefore, the rate of depression in our sample is similar to those previously reported. Also, depressive symptoms in our sample were significantly associated with impaired sleep. The elevated rates of depression and impairment among preclinical students may reflect problems in adaptation to coursework and to physician identity. Alternatively, increased responsibilities for housing, transportation, socialization and education along with a focus on identity exploration, may lead to increased rates of depression. The lack of effects of gender and residence may be due to sampling bias, while that of nicotine/alcohol use may reflect limited numbers of students using those substances [1]. Anxiety may also be elevated among medical students and studies have reported rates of significant anxiety symptoms ranging from 7.7 to 65.0 % [2]. In our whole sample, rates of severe, moderate and mild anxiety were 18.2 % ($n = 62$), 36.4 % ($n = 124$) and 45.5 % ($n = 155$), respectively, and those rates are in accordance with the literature. Anxiety among medical students may be associated with female gender, impending residency examinations, uncertainty about the future, preclinical education, and lower academic achievement [1,2]. We found that female gender and disrupted sleep were significantly associated with anxiety although educational tier was not. This difference may be due to the features of our sample.

Medical students may also experience impaired sleep quality with almost two-fifths reporting impaired sleep-in meta-analyses [5]. The main problems may be reduced sleep duration and daytime sleepiness affecting academic achievement [5]. In our whole sample, the rates of chronic impaired and impaired sleep were 25.8 % ($n = 84$) and 65.0 % ($n = 212$), respectively, and those rates are in accordance with the literature. In our sample, independent living status (i.e., dormitories or housemates) and anxiety were significantly related with impaired sleep in bivariate analyses. However, multivariate analyses revealed that depressive symptoms were the most significant predictor of impaired sleep.

Available studies suggest that ineffective and avoidant coping strategies may be related to anxiety, depression, and sleep problems in medical students [11]. Supporting this position, dysfunctional coping strategies displayed low, positive correlations with anxiety, depression and sleep impairment

in preclinical students and with anxiety/depression among clinical students. In bivariate comparisons, clinical students were significantly more likely to use emotion focused coping and preclinical students were significantly less likely to employ positive reinterpretation, instrumental and emotional social supports and substance use compared to clinical students. These results may suggest less use of active coping strategies among preclinical students in our sample, while substance use for coping may increase among clinical students. Similarly, it was found that preclinical students used denial and behavioral disengagement significantly more frequently compared to clinical students [8]. Transition from preclinical to clinical tiers may affect the perception of medical students and may correlate with a change in predominant coping styles [20,21]. Those female students in our sample used emotion-focused and dysfunctional coping significantly more frequently. Some of the available studies report that gender of medical students did not affect predominantly used coping skills [22]. However, some studies suggest that male medical students may use active coping skills or even maladaptive ones more frequently [23]. This discrepancy may be due to cultural differences between our sample and those previously evaluated.

Our results should be evaluated within their limitations. Firstly, we could reach only 80.1 % of the planned sample, and this may have affected our results. Secondly, our results may only be valid for our medical faculty. Thirdly, since we evaluated depression, anxiety and sleep quality with self-reports, they may be subject to recall and response bias. Fourth, study data were collected prior to the COVID-19 pandemic and the pandemic may have affected the results [24]. Fifth, inclusion of clinical interviews with the students may have enabled us to discern clinically significant levels of depression, anxiety and sleep impairment more objectively.

Conclusion

Regardless of those limitations, our results suggest that Turkish medical students may display elevated rates of depression, anxiety and sleep impairment especially in the preclinical years. Also, depressive symptoms significantly predict sleep impairment in this sample, and dysfunctional coping may correlated with depression, anxiety and sleep impairment. Preclinical students may benefit from mental and behavioral interventions including counselling, while clinical students may benefit from interventions targeting nicotine and alcohol use.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: None

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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How to cite this article:

Mesut Yıldız. Relationships between depression, anxiety, sleep and coping skills among medical students: A cross-sectional study. *Ann Clin Anal Med* 2023;14(5):454-458

This study was approved by the Clinical Research Ethics Committee of Marmara University Faculty of Medicine (Date: 2019-05-03, No: 09.2019.508)